ONLINE DATA VISUALIZATION FOR UMP STRATEGIC PLAN DASHBOARD

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TECHNICAL SUBMITTED IN FULFILMENT OF THE DEGREE OF COMPUTER SCIENCE

FACULTY OF COMPUTER SYSTEM AND SOFTWARE ENGINERRING

2013

ABSTRACT

Measuring UMP Readiness to Implement Online Data Visualization

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Business Intelligence (BI) system is widely applied in many fields especially the business field which is for the purpose of producing a better decision in solving the problems and get more accurate analysis results with the visualization of graphical data. UMP is now currently using the traditional information system which is unable to represent the data or information with the suitable graphs or charts. This project is developed to build a prototype dashboard system for the purpose of monitoring the performance of each department in UMP according to the strategy plan which included the UKRA (University Key Area Result) and all of the KPI (Key Performance Index) by implementing online data visualization. Rapid Application Development (RAD) is the methodology implemented to develop this system. This dashboard system is believed can be helped in producing a better decision making solution for the problem faced through the effective graphical data form and also improving the quality of UMP.

Keywords: Business Intelligence (BI), Online Data Visualization, Readiness, Dashboard System

ABSTRAK

Mengukur Kesediaan UMP Melaksanakan Online Visualisasi Data

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Business Intelligence sistem (BI) digunakan secara meluas dalam pelbagai bidang terutamanya bidang perniagaan yang bertujuan untuk menghasilkan keputusan yang lebih baik dalam menyelesaikan masalah dan mendapatkan keputusan analisis yang lebih tepat dengan visualisasi data grafik. UMP kini masih menggunakan sistem maklumat tradisional yang tidak dapat mewakili data atau maklumat dengan graf atau carta yang sesuai. Projek ini dibangunkan untuk membina sistem dashboard prototaip bagi tujuan memantau prestasi setiap jabatan di UMP mengikut perancangan strategi yang termasuk UKRA (University Keputusan Kawasan Key) dan semua KPI (Key Performance Index) dengan melaksanakan visualisasi data secara online. Pembangunan Permohonan Rapid (RAD) adalah kaedah yang dilaksanakan untuk membangunkan sistem ini. Sistem dashboard tersebut dipercayai boleh membantu dalam menghasilkan penyelesaian yang lebih baik bagi membuat keputusan untuk masalah yang dihadapi melalui data grafik yang lebih berkesan dan juga meningkatkan kualiti UMP.

Kata Kunci: Business Intelligence (BI), Visualisai Data Secara Online, Kesediaan, Sistem Dashboard

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PART 1

INTRODUCTION

1.0 Introduction

In this era of information technology driven society, there are a lot of information around us at everywhere. In those information systems, there are huge amount of data inside and divided into different categories. Data is very important for every organization and they have to manage and analyze all of data accurately especially in the business field since they have to make a correct decision according to what have they analyzed. A good information or data management system will make or improve the quality of the whole organization since the solution of decision-makers is provided. Business Intelligence (BI) system is one of the suitable systems that can be used in any fields that need to manage the data properly and represent the data in the suitable graphical form. According to Ellis, S. D., & Morris, H. D. (2010), IDC Retails Insights had carried out a survey in implementing an analytics solution over 2,700 IT managers and the result shows that 91% of large enterprises (over 5,000 employees) have implemented an analytics solution, while 83% of medium-sized enterprises (500–5,000 employees) have done so too.

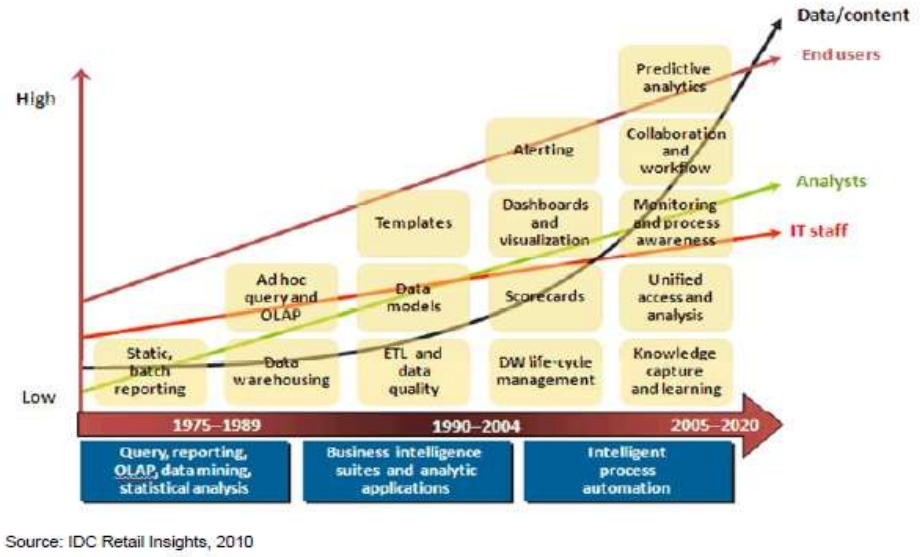

Figure 1.1: The Growing Influence of Business Intelligence (BI)

According to Ranjan, J. (2005 – 2009), Business Intelligence (BI) has two basic different meanings by the use of the term of intelligence. The first meaning is defined as the human intelligence capacity. This described that the capability of human intelligence applied in the business affairs or activities. This can be said as the investigation of human in order of to solve different business problems according to their management and decision support. The second meaning is related to the intelligence of information valued for its currency and relevance. This is means as the expert information, knowledge and technologies efficient in the management of an organizational or any individual business. Business intelligence is one of the applications or ways to help the enterprise users for gathering, providing access to and analyzing data in order to improve their business decisions. There are a lot of factors that can affect the enterprise users to produce a better business decision which are the customers, competitors, business partners, economic environment and internal operations.

Business Intelligence (BI) can be said to replace the decision support, executive information systems and management information systems as defined by Thomsen (2003). According to Negash, S. (2004), BI system is the combination of data gathering, data storage and management of knowledge by using the analytical tools to present complex internal and competitive information to the planners or decision makers. By using this system, the useful information or decision can be delivered to the decision makers at the right timing and this enable them to save the time in the decision making

process. In this BI system, both of the structured and semi-structured data will analyzed by the analysts. Both of these types of data will be the inputs of the system and the examples of structured data are like OLAP, DW and DM while for the semi-structured data are conversations, graphics and business processes. Besides, Langseth and Vivatrat (2003) have summarized that the components of the BI will be real-time data warehousing, data mining, automated anomaly and exception detection, proactive alerting with automatic recipient determination, seamless follow-through workflow, automatic learning and refinement, geographic information systems and data visualization. Figure 1.2 represents the basic understanding of Business Intelligence.

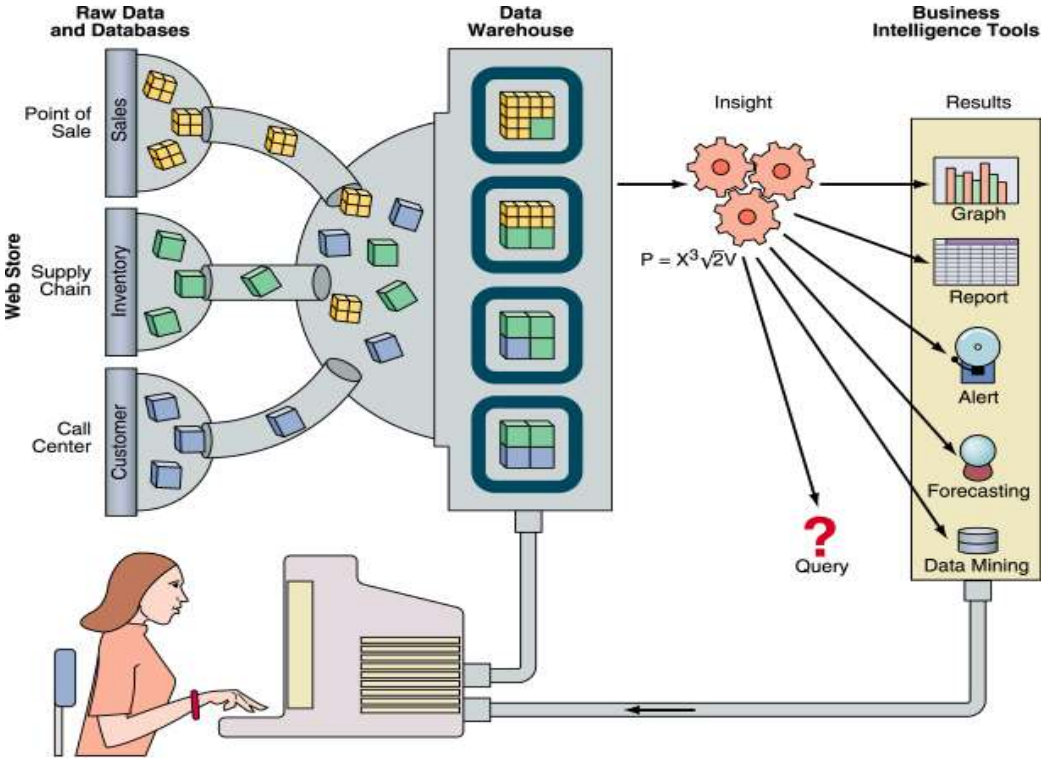

Figure 1.2: Basic Understanding of Business Intelligence (BI)

Apart from that, education field such as university can also implement BI system in term of managing the information and data of the whole university. University Malaysia Pahang (UMP) has to be aware with this since the management of data still not very well. By implementing the BI system, UMP can store all the data according to their categories accurately and will not mixing up the data since the data will be changed or increased year by year or anytime when the update is been made. Furthermore, UMP can also analyze the data that they needed and get the solutions from

the analytical tool which is the dashboard with those graphs and charts to improve the decision making skill based on the problem faced. Therefore, UMP dashboard system is designed in order to let the human resources which included the both of the staffs and top levels of every department in UMP to visualize the achievement based on the strategic plan and improve the quality of UMP.

1.1 Problem Statement

Nowadays, most of the offices or analysts are still using the traditional or conventional information system and analytical tools such as spread sheets, desktop databases, Google Analytics and others instead of using Business Intelligence (BI) system to store and analyze all of the data. First, some of the traditional information system cannot store huge amount of data and maybe will mixing all of the data at the end. University Malaysia Pahang maybe will face this kind of problem since the data are changing or updating time by time especially when the new semester is started. UMP can store and manage or arrange all of data accurately by using the dashboard system.

Besides, the traditional information system sometimes will lack of the information that the users needed. This will slow down the decision making process and there will be no sufficient time for waiting another process in this fast, interconnected and complex world nowadays. By using the analytical tools in the dashboard system, UMP can easily analyze all the data through the graphical form and get the accurate information about the problem that they faced. Then, planning for the decision will be started and the best solution of the decision will be produced at the end. This enable UMP to save a lot of time in thinking of the decision and can make sure the main cause of the problem can be detected correctly.

Apart from that, the traditional information system can only store some basic information but dashboard system can store more detailed information. UMP consists of many departments and there are huge amount of data. It is hard for the traditional information system to store the detailed information for each department. This maybe will cause the database of the information system overloaded. Then, this maybe will affect the quality of UMP to be decreased and cannot achieve the goals in the strategy plans.

Lastly, traditional information system only will display the specific data with some basic or familiar graphs or charts such as bar chart, pie chart, line graph and others or sometimes only will display all the data in a table form. Through this way, the users might not be able to digest the data in the table and the basic graph might not suitable to be used as visualizing the specific data. This will cause the information or message delivered to the user is wrong. But for the dashboard system, it will use different and the most suitable graph to display the specific data in order to make sure the users can easy to visualize the data and make the decision. So, there must be a right graph or chart for the right data in order to deliver the right information.

1.2 Objective of project

The objectives of this project are

i. to build a prototype of dashboard system to make the decision making process to be more effective and accurate in order to solve the problem after analyzed.
ii. to increase the readiness or awareness of UMP to implement the online data visualization.
iii. to improve or increase the knowledge, skills and experience in using the online data visualization among the UMP in term of analyzing and managing the data and information.

1.3 Scope of project

i. This project will included both of the staffs and students since the system will get the data according to the different types of UKRA (University Key Area Result) in University Malaysia Pahang (UMP).
ii. The decision making mostly will depend on the problem which is the data analysis of UKRA (University Key Area Results) and KPI (Key Performance Index) such as the academic achievement of the student, the satisfaction of the staffs and others.
iii. The data will be received from the Pusat Pembangunan Korporat & Pengurusan Kualiti (PPKPK) which is the client of this project.
iv. The techniques that will be used in this project are HTML5, JavaScript, XML, CSS, Data Visualization and some of the other related techniques.

1.4 Terminology

i. Business Intelligence (BI) is a process of taking large amount of data, analyzing the data and lastly condensing the valued data into a high-levels set of report to enable the management to take the basis business actions through the making of better business decisions, Stackowiak et al. (2007). It is the combination of data gathering, data storage and management of knowledge by using the analytical tools to present complex internal and competitive information to the planners or decision makers as defined by Negash, S. (2004).

ii. OLAP (On-line analytical processing) is the way in which business users can find their way through the data by using some complicated tools that allow for the navigation of dimensions such as time or hierarchies. It is also providing multidimensional, condensed views of data and also for the purpose of reporting, analysis, modeling and planning for optimizing the business.

iii. Advanced analytics is the process of data mining and forecasting or predictive analytics which is for the purpose of predict certainty measures on facts and also discover the trends and analyze the critical factors.

iv. Real time Business Intelligence (BI) is the distribution of metrics through email, messaging systems and/or interactive displays.

v. Data warehouse is the major component of business intelligence and it supports the physical propagation of data by handling the numerous enterprise records for integration, cleansing, aggregation and query tasks.

vi. Data sources mean the operational databases, historical data, external data, or information from the existing data warehouse environment, relational databases, structured information and unstructured information.

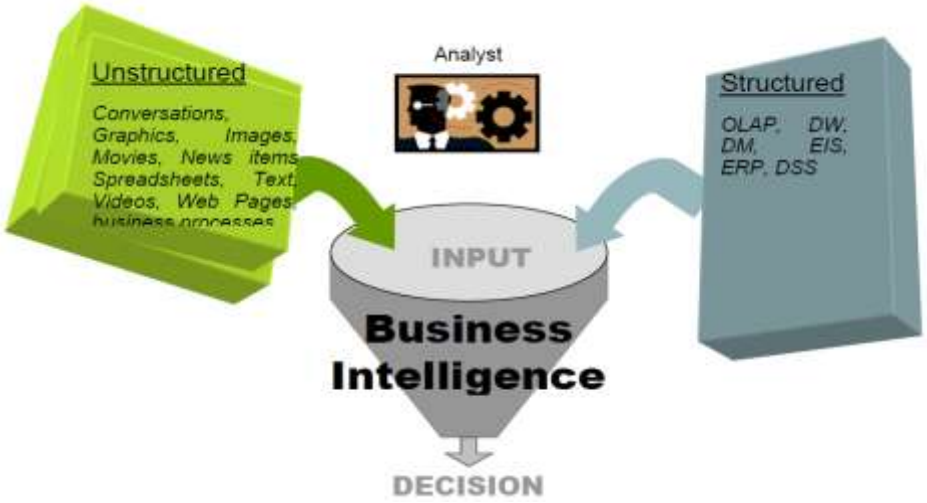

Figure 1.3: Inputs to Business Intelligence System

vii. Data visualization is a process of transforms data, information and knowledge in a visual form to enable us to observe, manipulate, search, navigate, explore, filter, discover, understand, and interact with the large volume of data. The data will be represented in graphical form instead of using a table. The information of the data will be revealed in a good display in order to let the viewers to see the structure of data correctly as defined by Chen, C. H., Härdle, W., & Unwin, A. (2008).

viii. Dashboard system is a system that collects, manages and present data and information which allow the users to make decision based on data from any number of sources. There will be three main layers for this system which the top layer is for designing and displaying the information. The middle layer is a data management layer for data propagation and aggregation. Then, the bottom layer is for data collection and processing (Ly, S., 2004).

1.5 Reasons for Business Intelligence (BI)

Most of the companies nowadays are choosing Business Intelligence is because BI enables their companies to make well informed business decisions and thus can be the source of competitive advantages. By using BI, the firms are able to extrapolate the information and make accurate forecasts or visualization about the trends or the current conditions of economic. They can make the accurate decisions through the analysis

from BI and this will benefit the firms at last. Besides, they can also improve the timeless and quality of information by investing BI. Through BI, it can reveal several things like the position of the firm as in comparison to its competitors, the changes in customer behaviors and spending patterns, market condition, future trends, demographic and economic information.

Apart from that, the companies have realized that the trend of business environment nowadays is very competitive, fast paced and changing so rapidly. So they have to respond and adapt to change in a short time or as fast as possible. This is another reason for them to choose Business Intelligence since it can help them to use the information gathered in order to respond to the changes quickly and constantly.

1.6 Existing System of Business Intelligence (BI)

Nowadays, Business Intelligence is used widely among the companies especially in the business field. Based on Kestelyn (2003), there are 12 firms of identified BI with the editors's choice award which included Adaytum, Brio Software, Cognos, Crystal Decisions, E.Intelligence, Fair Issac & Co., Hyperion Solutions, Information Builders, MicroStrategy, ProClarity, Siebel Systems, and Spotfire. Furthermore, Stodder (2003) has mentioned 12 vendors as most influential in the overall category which included Teradata, SAS, IBM, OutlookSoft, Business Objects, Microsoft, Manhattan Associates, PeopleSoft, Oracle, Ilog, Insight Software, and Open Source/Linux. There are a lot of BI tools or systems available in the market that can be used by the decision makers in the firms. There are many vendors for this BI suite and the most famous vendors which are IBM, Microsoft, Oracle and SAP. These four vendors are now known as the 'mega vendors' or Big Four. The top-tier or most widely used BI are such as Cognos, Business Objects and Hyperion Oracle Business Intelligence.

The frameworks of those existing systems are the important criteria or concept that I have to implement in the dashboard system for this project in order to make the process or functionality of the system runs properly. By implementing the dashboard system, then there will be a lot of benefits in order to monitor the performance of UMP.

1.6.1 Cognos

First, Cognos is owned by IBM (International Business Machines Corporation) and the members of Cognos family are included Cognos Insight, Cognos Express and Cognos Enterprise. There are some benefits of Cognos for the users and one of them is explore all types of information. Cognos is a complete performance management system built from the ground on a single, purpose-prepared SOA (Service-Oriented Architecture) platform. Cognos allows business users to access to all the data accurately and in shorter period of time. It also allows them to consume a fact-based statistical evidence to support their decisions in order to let them take a suitable action. Besides, they can also more understand to the current business situation by exploring the patterns that exist in the data.

Next, the business users can analyze the facts and anticipate tactical and strategic implications is also one of the benefits. They need the analytical tools to help them evaluate and identify the impact on the business and also the bottom line based on the different scenarios. Besides, Cognos is also allows the business users to analyze the facts and anticipate strategic implications by simply shifting from viewing data to performing more advanced predictive or what-if analysis. When they can understand the scenarios which affected their business then they will make a suitable recommendations or decision support in order to improve the performance of their business.

Apart from that, the solution that the users get from Cognos can be transformed and published in different languages and formats such as HTML, PDF and others. Moreover, they can access the solutions from several locations through portal, e-mail, mobile and others. Lastly, the interface of Cognos is user-friendly and easy to be explored by the users. The features of Cognos are maturity, stability, and high-participation planning solution.

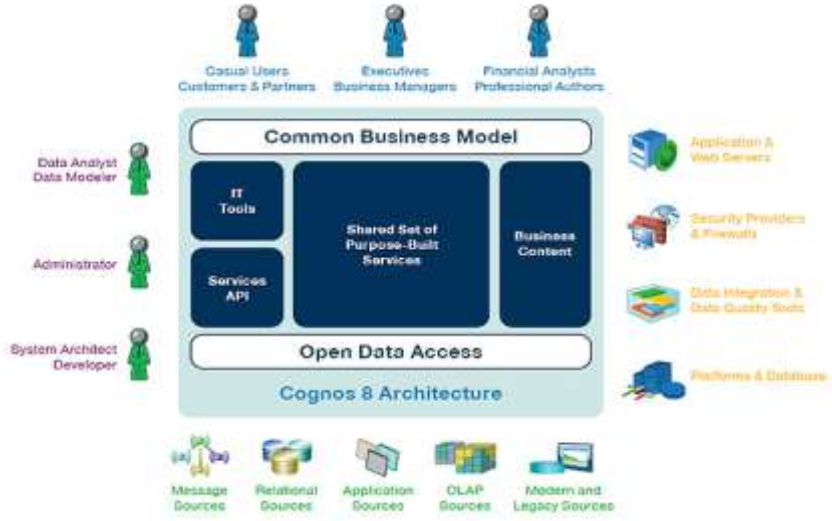

Figure 1.4: Architecture of IBM Cognos

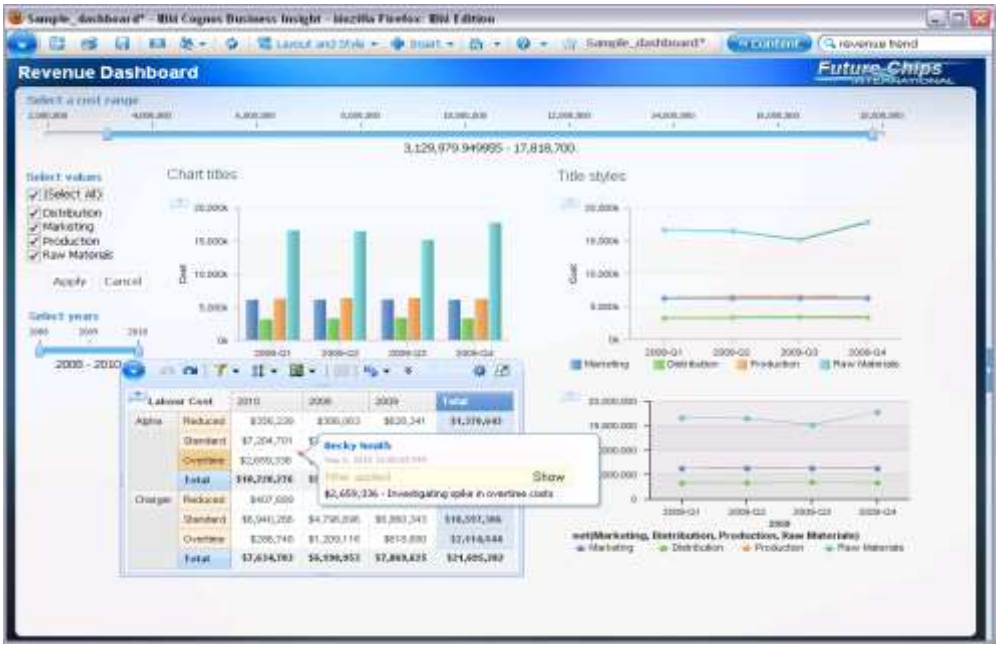

Figure 1.5: Interface of the Dashboard for Cognos

1.6.2 Business Objects (BO)

Second, Business Objects is now owned by the SAP (Systems Applications and Products in Data Processing) and is offers one of the broadest and most complete BI product sets. BO is a BI (Business Intelligence) tool which developed in the Adobe Flash Platform. This system has some benefits or strengths and one of them is allowed the users access to all the data that stored in the system easily and quickly to improve the growth of both productivity and performance. The retrieved data is very accurate

and according to the difficulty of the problems faced. Besides, consolidation and aggregation of data are also been applied in order to improve the efficiency.

Furthermore, the structure of the information in BO is flexible and good scalability. Although there are more receivers and more forwarded data but these will not slowing down the transfer rate and can also faster the decision making process. Next, all the information is unified what simplifies the access to all resources independently on their format or location diversification. BO platform is designed with a good interface where all the dashboards are designed to make the users easy to familiar with and also increase the service-intuitionism. Next, the software was created as a single intelligence platform in order to reduce the effort which is required for the cooperation of different users.

Apart from that, the structure of the platform enables an insight into the whole operations which enables the users to check every process within every stage on every level easily. This strength can make the decision making to be more accurate since the information is delivered time by time and it also shortened the time of reaction needed that leads to a better performance. Lastly, the deployment of BO is not complicated and this will increases the security and functionality of the platform that can be used by everyone.

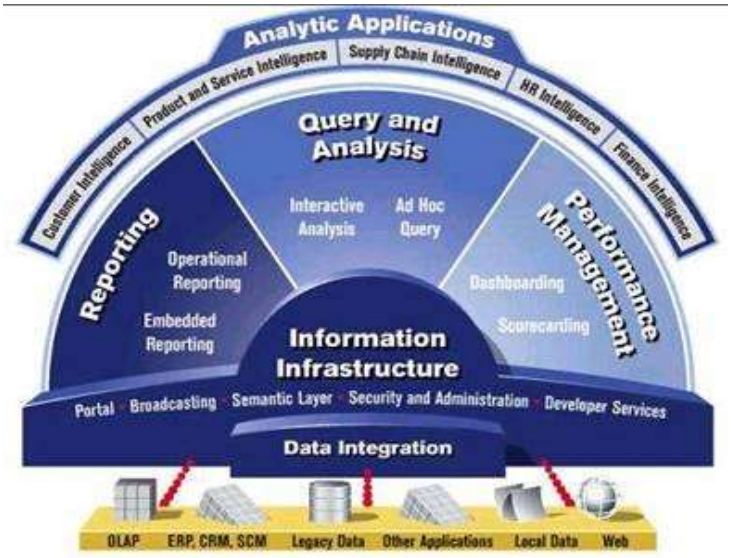

Figure 1.6: Architecture of SAP Business Objects

Figure 1.7: Interface of the Overview Dashboard for SAP Business Objects

1.6.3 Oracle Business Intelligence

Third, Oracle is now acquired Hyperion and offered a combination of BI platform and analytic applications such as Oracle Business Intelligence Enterprise Edition (OBIEE) and Oracle Analytic Applications. It is potential in delivering operational and strategic BI capabilities. The components of Oracle BI included Oracle BI Discoverer, Oracle BI Spreadsheet, Oracle BI Warehouse Builder, Oracle BI Beans and Oracle AS Reports Services.

Oracle BI Discoverer is an intuitive ad-hoc query, reporting, analysis, and Web-publishing tool that empowers business users at all levels to gain immediate access to information from data marts, data warehouses, online transaction processing systems, and Oracle E-Business Suite. Next, Oracle BI Spreadsheet provides OLAP data access from within Microsoft Excel worksheets and the users can also use the Oracle BI Beans Calculation and Query Builder Beans to analyze that data. Then Oracle BI Warehouse Builder enables rapid design, deployment, and management of data and metadata. Lastly, Oracle BI Beans builds powerful custom business intelligence applications while Oracle AS Reports Services provides enterprise reporting.

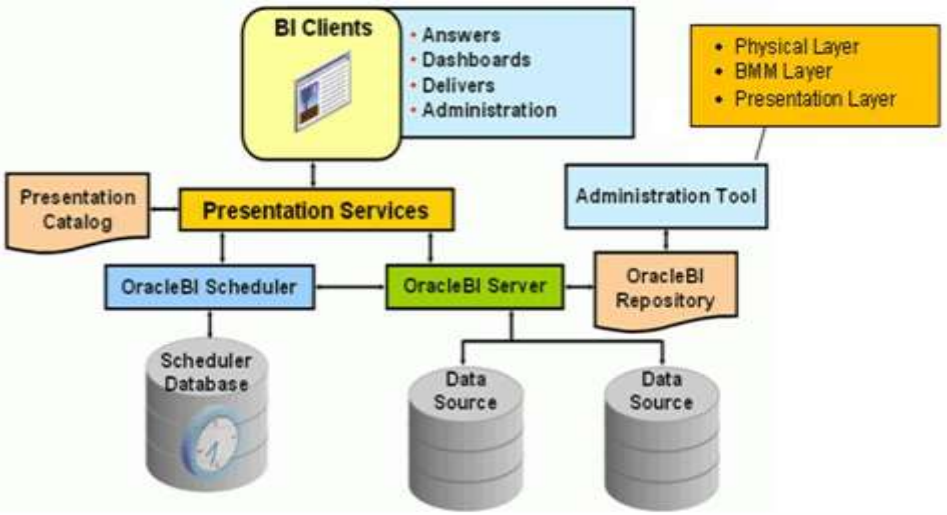

Figure 1.8: Architecture of Oracle Business Intelligence

Figure 1.9: Interface of the Dashboard for Hyperion Oracle Business Intelligence

1.6.4 Limitations of Existing System

i. IBM Cognos:

- Does not support its own ETL (Extraction, Transformation and Loading) and data quality software.
- Does not implement function of the offline reporting and analysis.

- Divided into more parts than it's necessary such as studios (Report Studio, Query Studio, and Analysis Studio) might be operated by one common tool.
- The documentation storing is difficult due to the lack of appropriate tool.
- Problem of visual analytics.

ii. SAP Business Objects

- Unclear Business Intelligence (BI) and Performance Management (PM) roadmap or strategy.
- Risk of gaining inconsistent data results since the data connections are inconsistence.
- The function of multiple locations options was inconsistent.
- The service of software is not satisfied by the users since they only can do some changes by themselves and most of them demand engaging the developers.
- Modifying the content requires complicated and labor-consuming IT lifting.

iii. Oracle Business Intelligence (Hyperion)

- Connectivity to heterogeneous sources requires DBA (database administrator) setup of database connectors.
- No access to non-relational legacy data sources.
- Scheduling of reports based on periodicity and events requires custom coding.
- No out-of-the-box security integration with non-Oracle solutions.